

Loss Mitigation Grant Program Wind Resistive Device (WRD) Product Evaluation

The product as described herein has been evaluated by the Department of Commerce and Consumer Affairs (DCCA) for compliance with the technical requirements for wind resistive devices installed in single or multi-family residential dwellings. Installation costs of approved products are partially reimbursable under the provisions of the Loss Mitigation Grant Program. The results of the product evaluation are presented in the following report.

1.0 Product Information

1.1 Product Name:

Titan II Accordion Shutter

1.2 Description:

The Titan II Accordion Shutter is an extruded aluminum, vertical slat, operable shutter designed to be permanently mounted to an exterior wall. The shutters can be latched to provide impact and wind pressure resistance to glazed openings. The vertical slats of the Titan II shutters are 0.045" thick.

1.3 Category:

Submitted for evaluation as a WRD option 3- Exterior opening protection

1.4 Submitted By:

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2.0 Product Evaluation

2.1 Wind Loads:

According to the test report document prepared by Hurricane Testing Laboratory static and cyclic wind load tests were conducted for 39" wide x 144" and 99½" tall test specimens. The test results are as follows:

| Test Specimen | Test Method | Test Conditions | Net Deflection | Residual Deflection |
|---------------|---------------|-----------------|----------------|---------------------|
| 39" x 144" | Static/Cyclic | +/-46 psf | +2.83", -3.81" | +0.08"/-0.21" |
| 39" x 144" | Static | +/-34.5 psf | +1.73", -1.90" | +0.01"/-0.03" |
| 39" x 99½" | Static/Cyclic | +110/-110 psf | +1.24", -1.21" | +0.06"/0.11" |

Although the deflections are quite high for the 144" tall specimen, they are acceptable at the design wind pressure if a separation of the sum of the net deflection and the residual deflection plus 25% is maintained between the shutter and the window glazing.

2.2 Impact Resistance:

Large and small missile impact tests were conducted in accordance with TAS 201 and ASTM E1888/1996. Again these were conducted for both 39" wide x 144" and 99½" tall test specimens. The results of these tests are as follows:

| Test Specimen | Missile | Net Deflection | Test Result |
|---------------|---------|----------------|-------------|
| 39" x 144" | D | -3.25" | Pass |
| 39" x 99½" | D | -2.25" | Pass |

Again the reported deflections of the 144" tall specimen were quite high. Yet, the WRD loss mitigation grant program requires only missile level C impact protection for product approval. Since the level C missile is roughly half the size of a level D missile and it is fired at a significantly slower velocity, it is assumed that adequate separation between the glazing and protective device can be maintained for a level C missile impact. Both panels also passed the small missile impact tests.

2.3 Installation:

Installation shall be performed strictly in accordance with the details indicated on sheets 1 through 5 of 5 of drawing No. 06-FSC-0006. The product must be installed with a minimum separation of the sum of the net deflection and the residual deflection plus 25% at the design wind pressure from the opening glazing. For installation on wood frame construction the drawings specify that the wood must have at least an SG=0.55 or better. In Hawaii, typically Douglas fir lumber is used for frame construction and it has an SG=0.50.

2.4 Substantiating Data:

- a. Drawing No. 06-FSC-0006, titled "Titan II Aluminum Accordion Folding Shutter", sheets 1 through 5 of 5, prepared by Engineering Express, signed and sealed by Frank L. Bennardo, P.E. (FL License No. 0046549) dated 12/26/2006
- b. Product Evaluation Report No. FL-6410, product name "Titan II Folding (Accordion) Shutter", sheets 1 through 3 of 3, signed and sealed by Frank L. Bennardo, P.E. (FL License No. 0046549) of Express Engineering, dated 3/06/2007
- c. Uniform Static Air Pressure Test, prepared by Hurricane Engineering & Testing Inc., Test Report No. HETI-96-542 dated 4/17/96, Signed and Sealed by Hector M. Medina, P.E. (FL)
- d. Test Report, prepared by Hurricane Test Laboratory, LLC, Test Report No. 0143-0408-02 (Miami-Dade), dated 4/24/02, Signed and Sealed by Vinu J. Abraham, P.E. (FL Reg.# 53820)

3.0 Findings

Evaluation in review of the submitted data indicates that the Titan II Aluminum Accordion Folding Shutter does conform to the requirements of the loss mitigation grant program, and at this time is approved as an acceptable WRD for use on **masonry construction only**. The drawings specify that attachments to wood structures must be of a higher grade wood than is typically used in Hawaiian construction. Therefore, either approval of the product for use on Douglas Fir must be made or the structure must be retrofitted with a higher grade of wood. No anchorage details or test results have been provided for single wall construction common to Hawaii. Additional data must be submitted for WRD approved use on this construction type.

3.1 Limitations:

- a. The Titan II Accordion Folding Shutter is approved as an acceptable WRD under the requirements of the loss mitigation grant program for use on masonry construction only.
- b. Submit additional details and test data for approved use on single wall construction.
- c. Provide alternative or approved connection schedule for product use on Douglas fir wood framing members.
- d. Design wind loads for product installation shall be determined in accordance with ASCE 7-05. On Oahu, exposure, directionality and topographic factors shall be per the Honolulu Building Code.

WRD No. 00017

March 6, 2008

A handwritten signature in black ink, appearing to read "Gary Y. K. Chock". The signature is fluid and cursive, with the first name "Gary" being more prominent.

Gary Y. K. Chock, S.E.

Product Examiner

March 6, 2008